

**CLAIMS**

1. In a cooling system having a refrigerant evaporator, a heat  
2 exchanger comprising:

4 a suction line for refrigerant output from said evaporator, said suction line  
6 including first and second substantially parallel straight cylindrical  
8 portions connected in series whereby said second straight  
10 cylindrical portion receives gaseous refrigerant from said first  
12 straight cylindrical portion; and

14 a capillary tube adapted to carry cooled refrigerant to said evaporator,  
16 said capillary tube including first and second helically wound  
18 portions connected in series whereby said second helically wound  
20 portion receives cooled refrigerant from said first helically wound  
22 portion, said first helically wound portion being wrapped around  
24 said suction line second straight cylindrical portion and said  
26 second helically wound portion being wrapped around said suction  
28 line first straight cylindrical portion.

2. The heat exchanger of claim 1, further comprising a bypass  
2 safety valve between an inlet to said first helically wound portion of said capillary  
4 tube and an outlet from said second helically wound portion of said capillary  
6 tube, said bypass safety valve opening responsive to a selected pressure  
8 differential between said inlet to said first helically wound portion of said capillary  
10 tube and said outlet from said second helically wound portion of said capillary  
12 tube.

2       3. The heat exchanger of claim 1, wherein said suction line  
includes a U-shaped portion connecting said first and second cylindrical portions  
of said suction line.

2       4. The heat exchanger of claim 1, further comprising an  
accumulator between said first and second cylindrical portions of said suction  
line.

2       5. The heat exchanger of claim 1, wherein said refrigerant  
comprises CO<sub>2</sub> and said capillary tube is an expansion device for said cooled  
CO<sub>2</sub> refrigerant.

2       6. The heat exchanger of claim 1, wherein said cooling system  
is transcritical.

2       7. In a cooling system having a refrigerant evaporator, a heat  
exchanger comprising:

4           a suction line for refrigerant output from said evaporator, said suction line  
including  
6           a straight portion substantially cylindrical about an axis, and  
an accumulator between said evaporator and said suction line  
8           straight portion, said accumulator including  
a phase separation chamber having an input for refrigerant  
from said evaporator and an outlet for gaseous  
10          refrigerant from which oil and liquid droplets have  
been separated in said phase separation chamber,

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12           a accumulator including a discharge opening for  
                  discharging oil to return said oil to said system,  
14            a vertical pipe between said phase separation chamber and  
                  said accumulator; and  
16           a capillary tube adapted to carry cooled refrigerant to said evaporator,  
                  said capillary tube including a portion helically wound around a  
18            central axis generally coinciding with said suction line straight  
                  portion axis.

2           8. The heat exchanger of claim 7, further comprising a second  
                  vertical pipe between said phase separation chamber and said accumulator,  
                  said second vertical pipe adapted to hold a selected volume of refrigerant  
4           charge.

2           9. The heat exchanger of claim 7, wherein said cooling system  
                  is transcritical.

2           10. The heat exchanger of claim 7, wherein said refrigerant  
                  comprises carbon dioxide.